

WHAT IS CLAIMED IS

1. A specific point detecting device for detecting positions of one or more specific points on a target image, comprising:
  - 5 updating means for updating detection parameters for detecting said specific points, in such a way as to follow changes in how said specific points on said target image are viewed; and
    - 10 detecting means for detecting the positions of said specific points on said target image, based on the detection parameters updated by said updating means.
  2. The device according to claim 1,
    - 15 wherein said target image is a first photographed image photographed by first photographing means that is movable, and
      - 20 said specific points are static specific points in a real space.
  - 20 3. The device according to claim 2,
    - 25 wherein said detecting means further comprises:
      - first calculating means for calculating the viewpoint position and/or posture of said first photographing means; and
      - narrowing means for narrowing specific points to be detected, based on the viewpoint position and/or posture calculated by said first calculating means.

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4. The device according to claim 2,  
wherein there is a plurality of said first  
photographing means,  
said detecting means comprises a plurality of  
5 detecting units corresponding respectively to said  
plurality of first photographing means, and  
said plurality of detecting units each detects the  
positions of said specific points in the first  
photographed image photographed by corresponding said  
10 first photographing means, based on the detection  
parameters updated by said updating means.
5. The device according to claim 2,  
wherein said updating means comprises second  
15 photographing means in which the position and posture  
of the viewpoint and the focal distance are fixed, and  
generating means for generating said detection  
parameters, based on a second photographed image  
photographed by said second photographing means, and  
20 updates current detection parameters to detection  
parameters generated by said generating means.
6. The device according to claim 5,  
wherein said updating means updates detection  
25 parameters so that said detecting means can use  
detection parameters generated based on said second

photographed image photographed at a time same as said first photographed image, and

    said detecting means detects said specific points using detection parameters generated based on said

5     second photographed image photographed at a time same as said first photographed image.

7.     The device according to claim 5, comprising a plurality of second photographing means fixed on  
10    different viewpoint positions as said second photographing means,

    wherein said generating means generates said detection parameters based on such a plurality of second photographed images.

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8.     The device according to claim 7,

    wherein said plurality of second photographing means photographs one or more specific points in an overlapping manner,

20     said generating means generates detection parameters for the same specific point respectively based on photographed images obtained by a plurality of second photographing means, and

    said detecting means detects the specific point  
25    based on a plurality of detection parameters with respect to the same point.

9. The device according to claim 8,  
wherein said detecting means comprises viewpoint  
position calculating means for calculating the  
viewpoint position of said first photographing means,

5 and

detects the positions of specific points, using  
detection parameters generated based on second  
photographing means nearest to the viewpoint position  
calculated by said viewpoint position calculating means,  
10 if there is a plurality of detection parameters  
corresponding to the same specific point.

10. The device according to claim 1,

wherein said updating means comprises second  
15 photographing means in which the position and posture  
of the viewpoint and the focal distance are fixed, and  
generating means for generating said detection  
parameters based on a second photographed image  
photographed by said second photographing means, and  
20 updates current detection parameters to parameters  
generated by said generating means.

11. The device according to claim 10, comprising a  
plurality of second photographing means fixed to  
25 different viewpoint positions, as said second  
photographing means,

wherein said generating means generates said detection parameters based on the plurality of second photographed images.

- 5       12. The device according to claim 11,  
          wherein said plurality of second photographing  
means photographs one or more specific points in an  
overlapping manner,  
          said generating means generates detection  
10      parameters for the same specific point respectively  
based on a plurality of second photographing means, and  
          said detecting means detects the specific point  
based on a plurality of detection parameters with  
respect to the same specific point.  
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13. The device according to claim 12,  
          wherein if there is a plurality of detection  
parameters corresponding to the same specific point,  
said detecting means detects the specific point based  
on each detection parameter, and a detected position by  
the detection parameter having the best evaluation  
value of detection accuracy is adopted, thereby  
detecting the position of the specific point.

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25      14. The device according to claim 10,

wherein said generating means comprises supplying means for supplying the position or area of said specific point on said second photographed image, and extracts a partial image including said specific

5 point from said second photographed image based on the position or area supplied by said supplying means, and generates said detection parameters based on the partial image.

10 15. The device according to claim 14,  
wherein said supplying means retains as known information the position or area on said specific point on said second photographed image, and supplies the position or area.

15  
16. The device according to claim 14,  
wherein said supplying means retains as known information the three-dimensional position of said specific point and camera parameters of said second 20 photographing means,

comprises specific point position calculating means for calculating the position of said specific point on said second photographed image, based on the three-dimensional position of said specific point and 25 the camera parameters of said second photographing means, and

supplies the position calculated by said specific point position calculating means.

17. The device according to claim 14,  
5       wherein said supplying means comprises feature extracting means for extracting a featured partial area from said second photographed image, and  
          supplies the position or area of said featured partial area extracted by said feature extracting means.  
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18. The device according to claim 10,  
      wherein said generating means generates detection parameters based on one photographed image photographed at a single time by said second photographing means.  
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19. The device according to claim 10,  
      wherein said generating means generates detection parameters based on a plurality of photographed images photographed at a plurality of times by said second photographing means.  
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20. The device according to claim 10,  
      wherein said updating means determines timing in which update of detection parameters is performed,  
25    based on the contents of said second photographed image.

21. The device according to claim 20,

wherein said updating means performs update of detection parameters, if a degree of difference between a new second photographed image and the second photographed image at the time of latest update of  
5 detection parameters exceeds a predetermined value.

22. The device according to claim 20,  
wherein said updating means controls update of  
detection parameters, based on changes in detection  
10 parameters generated by said generating means.

23. The device according to claim 1,  
wherein said updating means updates detection  
parameters at a predetermined time interval.  
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24. The device according to claim 1,  
wherein said updating means comprises storing  
means for storing two or more kinds of detection  
parameters prepared in advance for each of said  
parameters prepared in advance for each of said  
20 specific points, and  
selecting means for selecting a detection  
parameter for detecting each specific point from two or  
more kinds of detection parameters stored in said  
storing means, in such a way as to follow changes in  
25 how the specific point is viewed, and  
updates current detection parameters to detection  
parameters selected by said selecting means.

25. The device according to claim 24,  
wherein said selecting means selects detection  
parameters based on the average intensity value of said  
5 target image.

26. The device according to claim 1,  
wherein said detection parameter is a template  
image including said specific points, and  
10 said detecting means performs template matching  
for said target image to detect the positions of said  
specific points on said image.

27. The device according to claim 1,  
15 wherein said detection parameters are information  
expressing color and/or intensity unique to said  
specific points, and  
said detecting means extracts areas having the  
color and/or intensity unique to said specific points  
20 from said target image, thereby detecting the positions  
of said specific points on the image.

28. A specific point detecting method of detecting  
positions of one or more specific points on a target  
25 image, comprising:  
the updating step of updating detection parameters  
for detecting said specific points, in such a way as to

follow changes in how said specific points on said target image are viewed; and

the detecting step of detecting the positions of said specific points on said target image, based on the  
5 detection parameters updated in said updating step.

29. The method according to claim 28,

wherein said target image is a first photographed image photographed in a first photographing step by  
10 first photographing means that is movable, and  
said specific points are static specific points in a real space.

30. The method according to claim 29,

15 wherein said detecting step further comprises:  
the first calculating step of calculating the viewpoint position and/or posture of said first photographing means, and  
the narrowing step of narrowing specific points to  
20 be detected, based on the viewpoint position and/or posture calculated in said first calculating step.

31. The method according to claim 29,

wherein there is a plurality of said first  
25 photographing means, and

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in said detecting step, a plurality of detection processing corresponding respectively to said plurality of first photographing means is performed, and

in each of said plurality of detection processing,

5 the positions of said specific points in the first photographed image photographed by corresponding said first photographing means are detected, based on the detection parameters updated by said updating means.

10 32. The method according to claim 29,

said updating step comprising:

the second photographing step of taking photographs by photographing means in which the position and posture of the viewpoint and the focal 15 distance are fixed, and

the generating step of generating said detection parameters, based on a second photographed image photographed in said second photographing step are comprised,

20 wherein current detection parameters are updated to detection parameters generated in said generating step.

33. The method according to claim 32,

25 wherein in said updating step,

detection parameters are updated so that detection parameters generated based on said second photographed

image photographed at a time same as said first photographed image can be used in said detecting step, and

in said detecting step, said specific points are  
5 detected using detection parameters generated based on said second photographed image photographed at a time same as said first photographed image.

34. The method according to claim 32,  
10 wherein in said second photographing step, photographs are taken by a plurality of second photographing means fixed on different viewpoint positions, and

in said generating step, said detection parameters  
15 are generated, based on such a plurality of second photographed images.

35. The method according to claim 34,  
wherein said plurality of second photographing  
20 means photographs one or more specific points in an overlapping manner, and  
in said generating step, detection parameters for the same specific point are generated respectively based on photographed images obtained by a plurality of  
25 second photographing means, and

in said detecting step, the specific point is detected, based on a plurality of detection parameters with respect to the same point.

- 5       36. The method according to claim 35,  
          said detecting step comprising a viewpoint  
          position calculating step of calculating the viewpoint  
          position of said first photographing means,  
          wherein the position of specific points is  
10      detected using detection parameters generated based on  
          second photographing means nearest to the viewpoint  
          position calculated in said viewpoint position  
          calculating step, if there is a plurality of detection  
          parameters corresponding to the same specific point.
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37. The method according to claim 28,  
      said updating step comprising:  
          the second photographing step of taking  
          photographs by second photographing means in which the  
20      position and posture of the viewpoint and the focal  
          distance are fixed, and  
          the generating step of generating said detection  
          parameters, based on a second photographed image  
          photographed in said second photographing step are  
25      comprised,

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wherein current detection parameters are updated to detection parameters generated in said generating step.

- 5       38. The method according to claim 37,  
          wherein in said second photographing step,  
          photographs are taken by a plurality of second  
          photographing means fixed on different viewpoint  
          positions, and
- 10      in said generating step, said detection parameters  
          are generated, based on such a plurality of second  
          photographed images.
- 15      39. The method according to claim 38,  
          wherein said plurality of second photographing  
          means photographs one or more specific points in an  
          overlapping manner, and  
          in said generating step, detection parameters for  
          the same specific point are generated respectively  
20      based on photographed images obtained by a plurality of  
          second photographing means, and  
          in said detecting step, the specific point is  
          detected, based on a plurality of detection parameters  
          with respect to the same specific point.
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40. The method according to claim 39,

wherein in said detecting step, if there is a plurality of detection parameters corresponding to the same specific point, the specific point is detected based on each detection parameter, and a detected 5 position from the detection parameter having the best evaluation value of detection accuracy is adopted, thereby detecting the position of the specific point.

41. The method according to claim 37,  
10        said generating step comprising a supplying step of supplying the position or area of said specific point on said second photographed image,

              wherein a partial image including said specific point is extracted from said second photographed image  
15        based on the position or area supplied from said supplying step, and said detection parameters are generated based on the partial image.

42. The method according to claim 41,  
20        wherein in said supplying step,  
the position or area on said specific point on said second photographed image is retained as known information, and the position or area is supplied.

25 43. The method according to claim 41,  
      wherein in said supplying step,

the three-dimensional position of said specific point and camera parameters of said second photographing means are retained as known information,

- the specific point position calculating step of
- 5 calculating the position of said specific point on said second photographed image based on the three-dimensional position of said specific point and the camera parameters of said second photographing means is comprised, and
- 10 the position calculated in said specific point position calculating step is supplied.

44. The method according to claim 41,

- wherein in said supplying step,
- 15 the feature extracting step of extracting a featured partial area from said second photographed image is comprised, and
- the position or area of said featured partial area extracted in said feature extracting step is supplied.

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45. The method according to claim 37,

- wherein in said generating step,
- detection parameters are generated based on one photographed image photographed at a single time in
- 25 said second photographing step.

46. The method according to claim 37,

wherein in said generating step,  
detection parameters are generated based on a  
plurality of photographed images photographed at a  
plurality of times in said second photographing step.

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47. The method according to claim 37,  
wherein in said updating step, timing in which  
update of detection parameters is performed is  
determined based on the contents of said second  
photographed image.

48. The method according to claim 47,  
wherein in said updating step, update of detection  
parameters is performed, if a degree of difference  
15 between a new second photographed image and the second  
photographed image at the time of latest update of  
detection parameters exceeds a predetermined value.

49. The method according to claim 47,  
20 wherein in said updating step, update of detection  
parameters is controlled, based on changes in detection  
parameters generated in said generating step.

50. The method according to claim 28,  
25 wherein in said updating step, detection  
parameters are updated at a predetermined time interval.

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51. The method according to claim 28,  
said updating step comprising:  
the storing step of storing two or more kinds of  
detection parameters prepared in advance for each of  
5 said specific points, and  
the selecting step of selecting a detection  
parameter for detecting each specific point from two or  
more kinds of detection parameters stored in said  
storing step, in such a way as to follow changes in how  
10 the specific point is viewed,  
wherein current detection parameters are updated  
to detection parameters selected in said selecting step.
52. The method according to claim 51,  
15 wherein in said selecting step, detection  
parameters are selected based on the average intensity  
value of said target image.
53. The method according to claim 28 wherein said  
20 detection parameter is a template image including said  
specific points, and  
in said detecting step, template matching is  
performed for said target image to detect the positions  
of said specific points.
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54. The method according to claim 28,

wherein said detection parameters are information expressing color and/or intensity unique to said specific points, and

- in said detecting step, areas having the color  
5 and/or intensity unique to said specific points are extracted from said target image, thereby detecting the positions of said specific points on the image.

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